TOWARDS A MINERAL POLICY FOR CANADA

Opportunities for choice

1974

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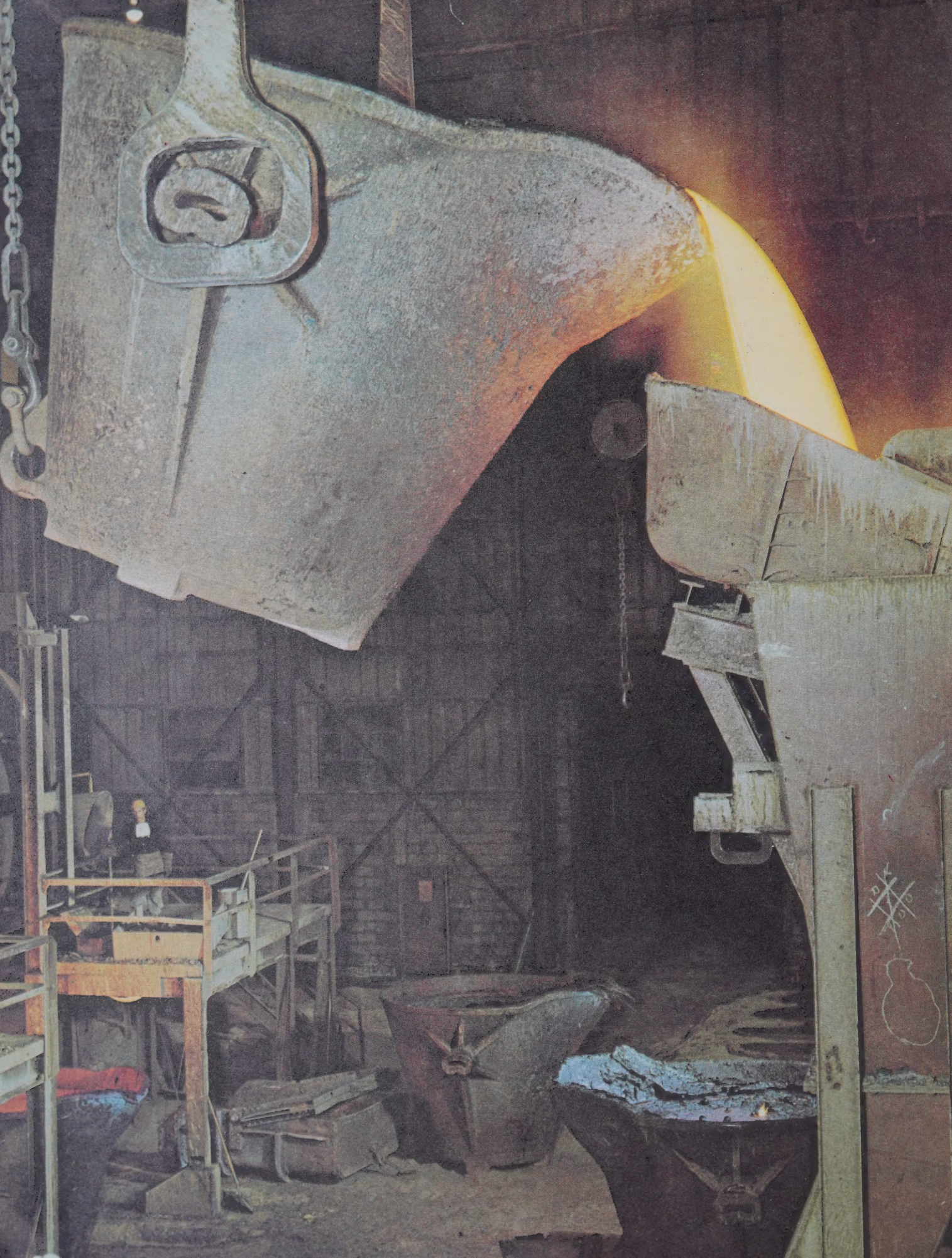

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FOREWORD

While continuing concerns of Canadian mineral policy will be conservation and assurance that Canadian domestic needs for minerals are met, mineral policy in future will be reshaped to place greater emphasis on increased economic diversification and better financial returns from mineral development.

Conclusions on this approach resulted from discussions held in Ottawa on December 6, 1974 by federal and provincial Ministers responsible for mineral policy at the first meeting of the Canadian Ministerial Conference on Mineral Policy. The Conference had its origins in meetings held in 1973.

In April 1973, Ministers authorized publication of a document entitled Mineral Policy Objectives for Canada. This second document entitled, Towards a Mineral Policy for Canada, is also published under authority of the Ministers to provide Canadians with a basis for considering mineral policy.

During their December 6 meeting, Ministers agreed that conclusions of the two documents, which represent the first two phases in the formulation of a national mineral policy dealing with commodities other than fossil fuels, provide a basis for considering the third phase of mineral policy development — the establishment of policies to achieve the desired emphasis among the objectives. Due to current concern about minerals, both within Canada and internationally, Ministers agreed on the need to proceed ahead with the third phase at an early date.

To achieve this end, they agreed on the need for closer consultation between federal and provincial levels of governments, but also recognized that individual governments may choose different priorities and degrees of emphasis.

Ministers discussed several separate approaches to the problems which currently affect minerals in Canada, but it was recognized that opportunities and problems differ among mineral commodities, mineral regions and through time. No one approach was considered adequate. The need to provide for active consultation with industry in developing mineral policy was recognized.

In reaffirming the need to reshape and explicitly state Canada's mineral policy, it was agreed that the following emphasis should be placed among the objectives as a basis for further discussion in the consideration of strategies:

> Mineral policy should first seek, whenever possible, to increase diversification and growth of national and regional economies based on minerals. This would include not only increased mineral processing but also more mineral-based manufacturing prior to export, and strengthened ties with other sectors of the economy.
>
> In cases where increased mineral processing and mineral-based manufacturing are not feasible, desirable or economic, mineral policy should then seek assurance that Canadians are obtaining the best return from mineral exports.

Under certain circumstances, it may be desirable to modify the rate at which economic diversification or increased financial returns are sought from minerals. For example, mineral policy should seek conservation for future use or stretched-out development where there is a possibility of depletion, or when the stability of Canadian communities is threatened by too rapid mineral exploitation, or when very high rates of investment affect economic stability.

Consideration also must focus on the need: to favour greater Canadian participation in a viable mineral sector; to seek better regional distribution of activities; and to minimize environmental damage.

Whatever direction mineral policy may take in the future, the first consideration must be to assure an adequate supply of minerals, whether from domestic or foreign sources, to meet Canadian needs.

Although the overall balance and emphasis of policy will change over time, and need not be uniform throughout Canada, mineral policy must maintain its general goal of obtaining the best benefits for Canadians from minerals.

The fact that the value of Canadian mineral production and exports (excluding mineral fuels) could increase substantially during the remainder of this century was considered by Ministers to represent a potential major expansion of economic activity that could have an important economic impact throughout Canada. The nature of this impact will depend on how future decisions affect the rate and pattern of mineral development and utilization.

Canada has obligations to continue to participate in the international mineral market as both an exporter and importer. Canada's role as a world mineral supplier however should not be construed as providing ever-increasing quantities of materials without regard to our need for balanced development of the Canadian economy. In other words, Canadian policy should not be "growth at any cost".

In recognizing the contribution and future role of the mineral industry in Canadian economic development, Ministers believe that governments' role in mineral management will increase with more involvement in mineral affairs both domestically and internationally. Managing the mineral system during the remainder of this century will be a major challenge to all Canadians since we are explorers, producers, processors, manufacturers, and consumers, and since we all are concerned with how best to use minerals—an important part of our national heritage.

TOWARDS A MINERAL POLICY FOR CANADA

Opportunities for choice

INTRODUCTION

The role of minerals in Canadian development is subject to public scrutiny and debate as never before. Mineral production for both domestic needs and export has grown steadily in recent decades, and there is a potential for even greater development in the future.

Opportunities from Minerals

A number of factors combine to highlight the importance to Canada of its minerals. (See Appendix C.) For example:

Canada is a major world mineral producer. We mine some 60 mineral commodities and process these to varying degrees. Canadians use these minerals but since we have such large production surpluses, we export about two thirds of our output.

Mineral-related activities have profound effects on the lives of many Canadians. They account for about 25 per cent of all exports and, directly or indirectly, for about 8 per cent of all employment and for 14 per cent of the gross national product. The effects of purchases and sales of the mineral sector permeate virtually all other sectors of the economy in all regions of Canada.

Canada's mineral resources are large, diversified and widely distributed. Our known reserves and expected future discoveries should fill domestic and export needs to at least the year 2000, if exploration efforts and technological advances are maintained. We will continue to depend on other nations for such materials as aluminum, chromium, manganese and tin, although changes in technology could eventually make domestic resources economic for some of these. Long-term mineral adequacy is always subject to some uncertainty and problems associated with local depletion will occur from time to time.

International factors will influence our ability to increase benefits from minerals. Such factors include the emergence of large trading blocs, resource-procuring strategies of other nations, international corporations and increased competition from other producing nations. We have the means to continue as a leading world supplier of minerals, but we have no overriding international competitive advantage.

Research and development by governments, industry and universities have played a key role in mineral industry development. Canada's expertise in the earth sciences and mineral technology has become an asset of international prominence.

World demand for minerals is expected to increase substantially in the years ahead. Based on this demand, Canada's mineral output could triple by the year 2000. This potential would provide major opportunities for increased income and employment, industrial diversification, and social development. However, policies of Canadian governments will have a major influence on how this potential is realized.

Minerals for What Purpose

From public discussions and government actions, it is clear that Canadians are now seeking a greater and perhaps different range of benefits from their mineral heritage. For example:

- Should minerals be primarily a means to expand and diversify domestic economic development ?
- Should mineral production and the export of surpluses be primarily a source of government revenues in support of other social and economic objectives ?
- Should the rate of mineral development be controlled or modified because of concern for the life-style and well-being of future generations ?

Mineral Policy Review and Status

Changing national aspirations and international pressures have led to a review of the Canadian mineral policy. The federal and provincial governments have agreed on a review process consisting of five phases:

Phase I: Definition of the mineral policy *goal* and *objectives;*

Phase II: Delineation of the *emphasis* to be placed on objectives;

Phase III: Definition of appropriate *strategies* and *tactics* to achieve the priority objectives;

Phase IV: *Implementation* of these policy strategies and tactics;

Phase V: *Evaluation* of results, and *policy adjustments* if necessary.

In April 1973 the federal and the provincial governments issued a document, *Mineral Policy Objectives for Canada**. Ministers agreed that the goal and twelve objectives (See Figure 1) for mineral policy presented in that document would form the basis for further mineral policy discussions. This completed Phase I of the policy review.

Since not all objectives can be attained to the same extent at any one time, the purpose of Phase II is to determine the emphasis which should be placed on these objectives. The present document considers alternative options for mineral policy and proposes that mineral policy be made flexible through selective emphasis of the objectives. It is not intended as a definitive statement on benefits that Canada should be seeking from minerals, nor is it a final blueprint for policy action. Rather, it is presented as a basis for full and informed discussion on alternative policy directions.

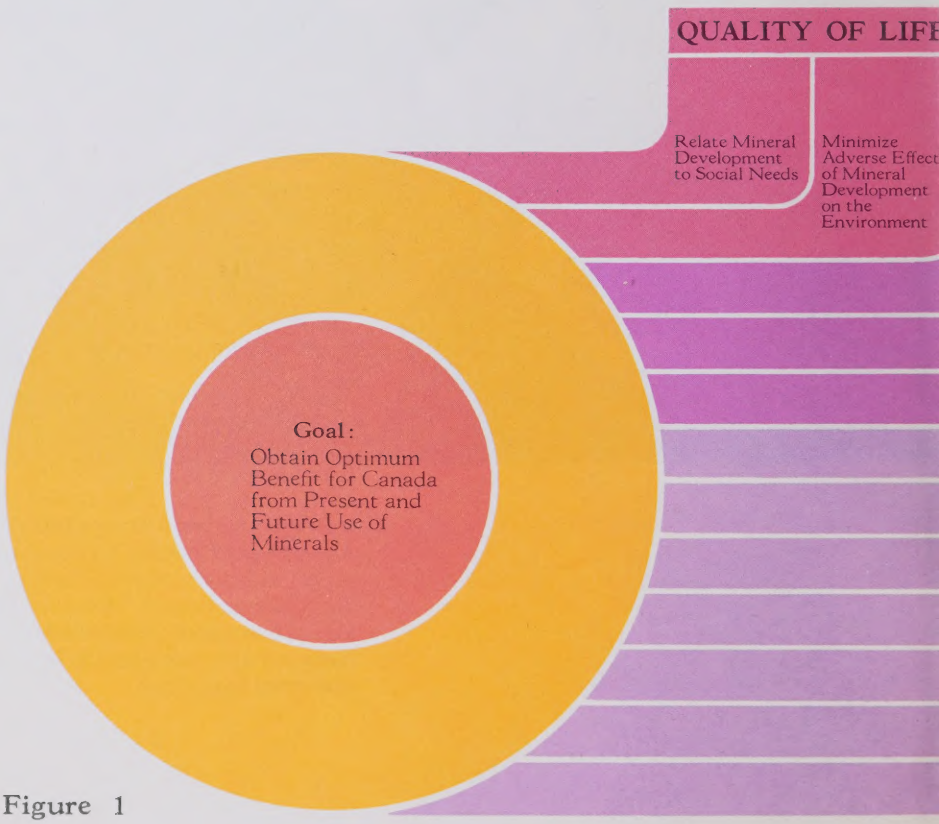


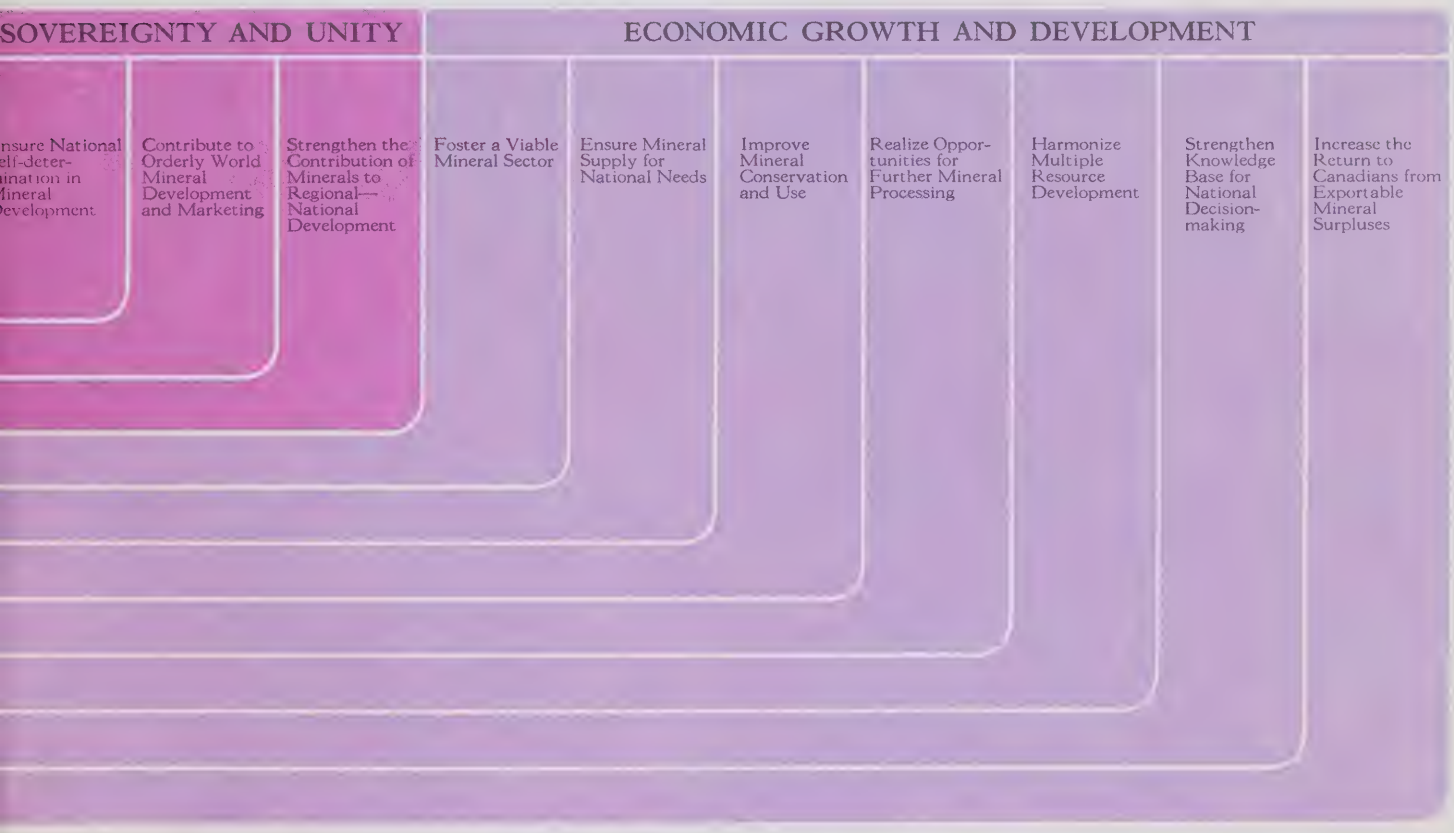
Figure 1

*This document is available, without charge, from the Department of Energy, Mines and Resources, Ottawa, or from provincial departments responsible for mineral policy. The Ministerial Communique released with the document is attached to the present document as Appendix A.

The Phase I and Phase II documents are the product of intergovernmental consultation*. The review process will continue into Phase III with the establishment of strategies. Using these documents as a basis, strategies will be developed in the light of opportunities and problems among commodities, and in the context of broad regional and national needs and priorities.

*Following Phase I, the Canadian Ministerial Conference on Mineral Policy was established on November 23, 1973. This formalized previous arrangements for consultation between federal and provincial Ministers responsible for mineral policy. The Ministerial Communique released following the November 23 meeting is attached as Appendix B.

MINERAL POLICY GOAL AND OBJECTIVES



What is the Mineral System

The mineral system can be defined as a series of activities that begins with the location of resources in the ground and ends with final consumption. Activities include exploration for and the discovery of minerals, followed by acquisition of mineral rights, mine property development, production of crude ores and concentrates, and further processing into primary metals or the equivalent. These materials are either sold directly to consumers or fabricated and assembled into consumer products. Used materials are recycled at various stages of the system, and former mine sites and waste dumps are reclaimed or abandoned. At each stage, the state of available technology has a critical bearing on the economic viability of the operation and the ability to realize new development opportunities.

The mineral system comprises public and private enterprises which are engaged in one or more of the above activities. In the production of primary mineral materials, these enterprises use mineral resources, investment funds, manpower, managerial and technical know-how, and a host of goods and services from both domestic and foreign sources. They market mineral commodities and related primary products, plus managerial and technological expertise, in Canada and throughout the world.

The mineral system has a positive impact on the economy, regionally and nationally. It generates income and employment directly and also indirectly through links with other sectors of the national and international economy. Many communities in Canada depend on mining or mineral processing for all or nearly all of their income. Mineral-based activities influence non-mineral sectors by the purchase of goods and services and by providing mineral materials in Canada and abroad. On the international scene, mineral activities provide bargaining leverage for Canada, and access to many international forums. In these ways. the mineral system gives impetus to Canadian development.

What is Mineral Policy

Mineral policy is the sum of government decisions and actions that influence the mineral system, and the ways in which the system itself affects the economy and society in general. Its elements are diverse and continually changing. Mineral policy contains more than laws and regulations that directly influence mineral exploration, extraction and processing. Other policy elements include export-import permits, regional development funds, pollution control laws, taxation, and social development programs.

The Role of Governments

The federal and provincial governments have constitutional responsibilities affecting the determination of mineral policy. The provincial governments own the mineral resources within their boundaries, and have broad powers that affect the management and rate of development of these resources. The federal government has broad powers in fiscal and monetary policies, interprovincial trade and transportation, external affairs, and in other areas affecting the national interest. In addition, it has responsibility for mineral affairs in the Yukon and Northwest Territories and in the other areas that fall under its jurisdiction.

Because of the nature of the mineral system and the division of powers among governments, neither the federal nor provincial governments can encompass the full spectrum of mineral policy. There is a high degree of interdependency among their respective policies and programs. While consensus on all policy issues would be difficult to attain at all times, governments wish to increase the degree of consultation on mineral policy formulation and program development so that actions within the various jurisdictions are mutually reinforcing

OPTIONS

The Meaning of the Options

The discussion now taking place in Canada on how minerals should best contribute to social and economic progress, seems to revolve around four, basically different, approaches. Some think that past policies are appropriate for the future. Others want our minerals to be used more decisively in promoting economic diversification. Another school of thought suggests that financial benefits could be increased by recognizing minerals predominantly as a source of dollars. Finally, others believe that we are disposing of our minerals on easy terms and at too rapid a pace. These four approaches represent options for mineral policy.

Option I: Continue, as in past decades, to encourage *maximum mineral production.*

Option II: Encourage *economic diversification and growth* through increased mineral processing and mineral-based manufacturing in Canada.

Option III: Obtain the highest possible *net financial returns* to Canadians from minerals.

Option IV: *Conserve mineral resources* for long-term domestic requirements.

Option I — Maximum Mineral Production

This option, in a historical perspective, is best typified by policies in existence in the 1950's and 1960's. It may be characterized, with some qualification, as seeking maximum mineral production. However, in recent years, federal and provincial initiatives have modified this approach in response to particular national and regional needs.

This option emphasizes a favourable business climate for the promotion of mineral development. Governments would continue to encourage the mineral industry. Traditional market mechanisms would continue to determine the rate and pattern of mineral exploration and production; to allocate available investment capital and skills between Canada and other mineral-rich countries, and among regions in Canada; and to apportion the financial benefits to investors, mineral users and the people of Canada.

Some major assumptions behind this option are:

- the market system satisfactorily distributes benefits from minerals;
- economic development based on minerals automatically arises when and where it is economically feasible;
- government support of the mineral industry will generate the best possible benefits for Canadians.

Option II — Economic Diversification

This option emphasizes the mineral policy objectives concerned with *strengthening the contribution of minerals to regional-national development* and *realizing opportunities for further mineral processing*. A more extensive, fully integrated mining, processing and manufacturing system would be sought, including stronger links between the mineral industry and other industrial and service sectors in Canada. Exports of crude or partially processed minerals would be discouraged by governments when scope is evident for further processing and fabrication. Where further processing or fabrication is not economically feasible, the export of unprocessed minerals would be allowed or even encouraged, providing appropriate benefits are forthcoming:

Some major assumptions behind this option are:

- appropriate policies will achieve greater mineral processing, fabricating, mineral-based manufacturing and intersectoral linkages over the long term through a mixture of private and public investment;
- Canada can develop a self-sustaining, diversified industrial structure beyond the year 2000 that will become less dependent on our mineral resources as a main vehicle for development.

Option III — Increased Financial Returns

This option emphasizes the mineral policy objective concerned with *increasing returns to Canadians from exportable mineral surpluses*. Governments' policies in their own jurisdictional fields, would seek increasing net financial returns from minerals through the best combination of such factors as production rates, domestic processing and export prices. Governments' shares of these additional revenues could be used in support of other priorities and alternative economic and social opportunities. Where prospective returns are viewed by governments as insufficient, proposed development would be deferred.

Some major assumptions behind this option are:

- governments can obtain increased net revenues from minerals through such means as higher taxes, royalties, reduced government expenditures in support of the industry, public equity participation, or higher export prices, without disproportionate effects on mineral sector development;
- governments' shares of these revenues will be redistributed effectively in support of other priorities according to the objectives of each government;
- postponed development will permit higher returns from minerals in the future.

The major distinction between Options II and III is that the latter recognizes opportunities may not exist for further processing and manufacturing in all commodities or regions at any point in time, whereas export of crude materials nevertheless may be attractive financially for Canada.

Option IV — Conservation for Future Use

This option emphasizes the mineral policy objectives concerned with *ensuring mineral supply for national needs, improving mineral conservation and use*, and emphasizing community stability. It would defer increases in mineral production, thereby reducing pressures that may discourage development in other sectors of the economy. These sectors would be looked to for future economic development. While financial returns and further processing would continue to be sought from minerals, the development process would be stretched out.

Some major assumptions behind this option are:

- Canada is in danger of depleting its minerals too rapidly;
- minerals left in the ground will not become obsolete through new discoveries elsewhere, substitution or technological change;
- postponed development will permit better benefits from minerals in the future;
- other economic activities will compensate, both nationally and regionally, for delayed growth in the mineral sector if further mining development is postponed.

The four options given represent the main range of current thought on how minerals might be used in the years ahead. They represent different perceptions of future Canadian development.

Despite the complexities involved, a decision on policy direction is urgent. While it may be possible to combine some aspects of two or more options, we cannot pursue the main elements of all four options simultaneously. Neither will policy based on one option alone be appropriate in the quest to increase the benefits Canadians derive from minerals. It is essential that mineral policy be flexible in light of diversities among regions, differences between mineral commodities, and changing economic and social conditions. Nevertheless, a choice on policy directions must be made.

A PROPOSAL FOR A FLEXIBLE MINERAL POLICY

It is proposed that, as a basis for further discussion, Canadian mineral policy be reshaped and restated within the context of the twelve mineral policy objectives, to reflect the following emphasis among them:

Mineral policy should first seek, whenever possible, to increase diversification and growth of national and regional economies based on minerals. This would include not only increased mineral processing but also more mineral-based manufacturing prior to export, and strengthened ties with other sectors of the economy.

In cases where increased mineral processing and mineral-based manufacturing are not feasible, desirable or economic, mineral policy should then seek assurance that Canadians are obtaining the best return from mineral exports. For example, some mineral commodities or some regions may not immediately lend themselves to further processing prior to export.

Under certain circumstances, it may be desirable to modify the rate at which economic diversification or increased financial returns are sought from minerals. For example, mineral policy should seek conservation for future use or stretched-out development where there is a possibility of depletion, or when the stability of Canadian communities is threatened by too rapid mineral exploitation, or when very high rates of investment affect economic stability. It may even be desirable to encourage developments that do not contribute sufficiently to either economic diversification or financial returns, but promise important contributions to other mineral policy objectives.

Consideration also must focus on the need: to favour greater Canadian participation in a viable mineral sector; to seek better regional distribution of activities; and to minimize environmental damage.

Whatever direction mineral policy may take in the future, the first consideration must be to assure an adequate supply of minerals, whether from domestic or foreign sources, to meet Canadian needs.

Although the overall balance and emphasis of policy will change over time, and need not be uniform throughout Canada, mineral policy must maintain its general goal of obtaining the best benefits for Canadians from minerals.

APPENDIX A

MINISTERIAL COMMUNIQUE OF APRIL 13, 1973

Ministers responsible for mineral policy in their respective provincial governments and the federal government, including the Territories, concluded in Ottawa on April 13, 1973, a series of meetings which had been held by them and under their authority.

At that meeting, Ministers agreed that a formal mechanism for consultation and co-operation should be developed among the provincial and federal governments to achieve more effective co-ordination in mineral policy development. Such a mechanism is essential for the formulation of mineral policies that are national in scope.

This document, *Mineral Policy Objectives for Canada*, will form the basis for further discussions by the Ministers. It relates to most minerals, but it does not apply to fossil fuels.

Within the context of closer co-operation which is sought at the governmental level, governments must take into account each other's jurisdiction in the translation of objectives into policies. This document is not intended to state or identify policies by which any government would achieve such objectives, nor does it attempt to define or specify the particular role of any one government. However, it is a first phase in the process of intergovernmental co-operation for arriving at a mineral policy for Canada. Nonetheless, governments will choose from a wide variety of strategies, programs, methods and techniques to achieve their objectives. References in the document to possible strategies are included only by way of example.

Canadians are becoming increasingly aware of the vital role which minerals play in the Canadian economy and in the growth of our national wealth. Suggestions of possible shortages and higher prices, both within Canada and internationally, have focused attention on the value to Canada of our mineral endowment and on the ever increasing need for wise management of our minerals. At the same time, Canadians seek increased social as well as economic benefits from minerals, and also seek that care for a variety of human and environmental values must be emphasized in mineral extraction and utilization.

In short, minerals and the way in which they are utilized have a fundamental impact on social and economic development throughout the nation.

Indeed, after meeting the mineral needs of Canadians, those minerals that are surplus to our needs are exported, and account for about one quarter* of total Canadian exports. Production for both domestic needs and export markets accounts directly for some 6 per cent of the nation's Gross National Product. Of even greater significance to Canadians is the overall impact that the mineral industry has on activity throughout the Canadian economy. Thus, a further 8 per cent of our Gross National Product is dependent upon the activities of the mineral industry. The large indirect impact is understandable when one reflects on the goods and services required to explore for, develop, produce, process, fabricate and transport minerals and mineral-based products within Canada and to other countries.

*Figures in this paragraph have been revised to reflect the results of more detailed analysis since April 1973, in order to correspond with figures elsewhere in the present document.

Looking to the future, there is every reason to believe that the mineral sector can continue to be both internationally competitive and an important means for enhancing national and regional development. However, Ministers emphasize that, despite our abundant mineral endowment, Canada does not have a monopoly on minerals. In fact, we must import some minerals to meet our requirements. Despite some concern that the world's mineral supply may become depleted, the more immediate problems to be faced by Canada are the increasing competition from other resource-producing nations and the efforts of larger industrial nations to secure greater long-term advantages for themselves from resource exporters.

While some differences among governments on mineral policy matters remain, the Ministers agreed that the real significance of their discussions is the beginning of new relationships among governments in the formulation of mineral policy for Canadians.

APPENDIX B

MINISTERIAL COMMUNIQUE OF NOVEMBER 23, 1973

A Canadian Ministerial Conference on Mineral Policy was established on November 23, 1973 by federal and provincial Ministers responsible for mineral policy. Co-chairmen of the meeting were the Honourable Leo Bernier, Ontario Minister of Natural Resources and the Honourable Donald S. Macdonald, Federal Minister of Energy, Mines and Resources.

Last April, Ministers had agreed on the need for a new consultative mechanism to facilitate the review and development of mineral policies that are national in scope. Ministers agreed today that intergovernmental consultation in the field of mineral policy means intergovernmental dialogue that takes place early enough in the policy making process so that the federal and provincial governments have the opportunity to influence each other's views. Intergovernmental consultation does not necessarily imply agreement.

In discussions, the consultative function was viewed as a continuous intergovernmental process whereby co-operation on analysis, and a sharing of views and perceptions, provide a better basis for policy decisions and actions by individual governments. While it may be possible and desirable to achieve intergovernmental consensus on some issues, the Conference should not be viewed as a joint decision-making body.

Ministers agreed that they will not expect that all issues of joint concern will be dealt with in the consultative process. Short-term crises may require immediate unilateral policy decisions and actions by an individual government in its area of responsibility. In this context, while the number and intensity of such situations might be reduced through the functioning of the Conference, future success will be related to consultations on medium- and long-term issues.

Policy decisions are the responsibility of individual governments. Ministers agreed that the Conference will be effective if it provides a sound foundation for intergovernmental discussion during the early stages of policy development.

The Conference is intended to meet a need not met by either existing interprovincial institutions or normal bilateral consultations among and between levels of government. The Conference is not a substitute for these important components of the total Canadian mineral policy system.

Ministers agreed that the Conference would be chaired jointly by the Federal Minister of Energy, Mines and Resources, and the Provincial Minister hosting the annual Provincial Mines Ministers Conference.

Ministers agreed that, in 1974, the Conference would focus on questions pertaining to: uranium policy; the respective roles of federal and provincial governments in the control, management and disposal of minerals; and further development of a Canadian mineral policy. Last April, Ministers released to the public a document on Mineral Policy Objectives for Canada as a basis for further discussion. The Honourable Donald S. Macdonald introduced proposals and Ministers agreed that the next step in the development of policies for minerals (not including mineral fuels) is the choice of priorities in order to obtain the best benefits from minerals for Canadians.

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Toronto November 23, 1973

APPENDIX C

MINERALS AND CANADIAN DEVELOPMENT

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1 How Important are Minerals to Canada

a) Canada as a World Mineral Producer

More than 60 different mineral commodities are produced in Canada and the gross value of Canada's mineral output in 1973 was about $5 billion (excluding mineral fuels). More than 60 per cent of this output is exported. These exports in turn represent about 25 per cent of Canada's total exports. On the world level, Canada ranks first as a producer of asbestos, nickel, silver, zinc and potash; second in gold and molybdenum; third in aluminum metal, gypsum, platinum and copper; fourth in lead; and about sixth in iron ore (Canada's percentage share of world production for several major minerals is shown in Table 6).

Canada also produces many additional minerals for domestic needs and export. Canada, for instance, ranks twelfth in world production of steel. However, despite our large and diverse resource base, we are not self-sufficient in all minerals. Canadian industry imports several key minerals such as aluminum ores, tin, chromium, manganese and phosphate rock. Some minerals are imported because there are no known economic deposits in Canada, while others are imported, despite production in Canada, for economic reasons such as the distance between domestic sources and domestic consumers.

b) Resources in Canadian Development

Throughout her history, Canada has relied on the export of resources to generate a major proportion of national employment and income. Various commodities have successively dominated as a leading stimulus to economic development: cod, furs, timber, wheat, and, most recently, minerals. Minerals, as a major component of exports, are primarily a 20th century phenomenon. In fact, many of our present producing areas were developed after 1945.

CANADIAN PRODUCTION OF MAJOR NONFUEL MINERALS

(% of total value, 1973)

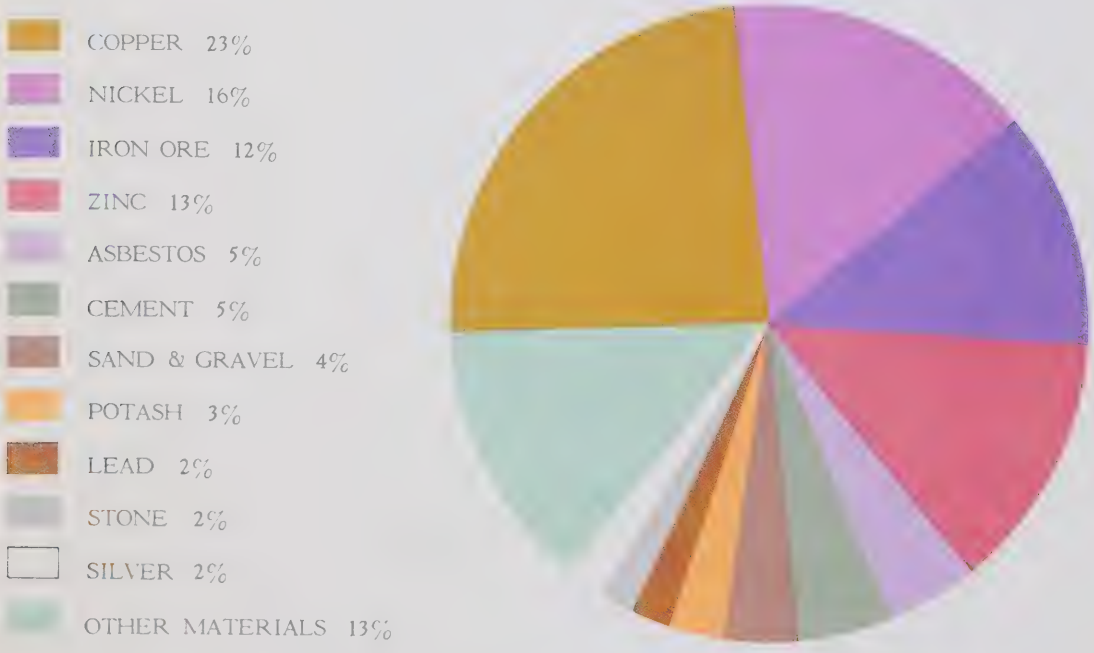


Figure 2

Canadian resource development has been largely in response to the needs of other industrial nations that are increasingly in a resource-deficit position. To stimulate mineral development, Canadian governments have evolved a system of incentives and controls and have invested heavily in support services such as ports, roads, railways, power supplies and airports. Expenditures on science and technology have been a major and necessary factor in fostering an internationally prominent mineral industry. More recently, some governments have stimulated mineral development through direct participation in the mineral industry (e.g., agencies for mineral exploration). Canada has sought not only income and employment from exports, but also the domestic processing of minerals to broaden industry and add value to exports.

How well have we done? Although this is difficult to measure because of information gaps, some facts and figures give an idea.

c) Contribution to National Income and Employment

The mineral industry, whose two main components are mining and processing, has been an important growth and export sector of the Canadian economy in recent decades. This is illustrated in Table 1. * Similar patterns have prevailed since the late 1940's except as noted in the footnote to Table 1.

*Current dollar value added is used because satisfactory deflators are not available for all sectors. In deflated terms, the economy as a whole grew at about 6% annually during this period.

But growth rates tell only part of the story. The contribution of minerals can be better examined by looking at mineral industry activities in relation to the gross national product (GNP), the labour force, wages and salaries, and exports. Table 2 includes data on direct contributions of the mineral industry to several of these economic indicators, as well as estimates of indirect contributions (i.e., through effects on other sectors of purchases by the mineral industry) to GNP, employment, and wages and salaries. The data do not reflect, however, the multiplier effects stemming from the expenditure of incomes derived from the mineral industry. Direct effects are based on 1970 statistics. Indirect effects are calculated from 1961 relationships, the latest available. Although changes have taken place in the economy since 1961, the statistics provide a reasonable approximation of indirect effects as defined.

Table 1:

Average Annual Sector Growth, 1961-1971

(in current dollar value added)

Mineral Industry		
Mining:	Metal mining	4.7%
	Nonmetallic mining	7.8%
	Total (less oil and gas)	6.1%
Primary Mineral Processing:	Metals	7.8%
	Nonmetallic mineral products	7.7%
	Total	7.8%
	Total Mineral Industry	7.5%
Other Sectors		
Mineral Fuels		10.8%
Agriculture, Forestry and Fishing		4.6%
All Manufacturing		7.8%
Construction		10.4%
Utilities		7.2%
Trade, Financial and Other Services		9.9%
Total for all sectors		9.0%

Note: Totals are weighted averages. Growth in metal mining averaged 8.0% between 1961 and 1970 but a large drop in output in 1971 resulted in the 4.7% average for 1961-1971.

The data in Table 2 illustrate that minerals account directly for 3.1 per cent of total employment in Canada, and have a progressively greater effect on wages and salaries (4.4 per cent), GNP (5.6 per cent), new capital expenditures (8.8 per cent), imports (10.5 per cent), and exports (25.1 per cent). Moreover, incorporation of indirect effects substantially increases the industry's impact on employment, wages and salaries, and GNP.

One means by which our understanding of the impact of the mineral industry on the rest of the economy can be improved is through the use of computerized economic models such as the CANDIDE model of the Economic Council of Canada. The CANDIDE model was used to indicate what might have happened in the economy had there been no growth in exports of mine products (except fuels) during the 1960-1970 period instead of growing as they did by nearly 10 per cent a year. This model was also used to estimate the economic impact of additional mineral processing on the economy.

While the specific results of such models have limitations, they generally tend to confirm that growth in mineral output has been a significant stimulus to the economy in recent decades. Moreover, they indicate that this has been reflected particularly in Canada's overall international trade, total investment and output of the service sector of the economy. Exports have been stimulated more than imports, and government revenues more than government expenditures.

d) Impact on Other Sectors of the Economy

The preceding statistics emphasize the importance of indirect relative to direct effects of the mineral industry because of its extensive impacts on other sectors of the Canadian economy. A few examples illustrate why this is so:

Transportation: About 47 per cent of all rail freight tonnage and nearly 40 per cent of all inland waterway freight are crude and fabricated mineral materials.

Construction: The mineral industry accounts directly for more than 8 per cent of all new capital investment in Canada. Virtually all new railway construction, several new ports and many new communities are the result of mineral development.

Table 2:

Approximate Relationships Between the Mineral Industry and the Canadian Economy

Mineral Industry Activity (less oil and gas) as % of National Economic Indicators	Direct Effects			Indirect Effects**
	Mining	Primary Mineral Processing*	Total	
GNP	2.7%	2.9%	5.6%	8.4%
Labour force***	1.0%	2.0%	3.1%	4.9%
Wages and salaries	1.6%	2.8%	4.4%	7.6%
Capital expenditures	4.6%	4.2%	8.8%	not available
Merchandise Exports	11.6%	13.5%	25.1%	not available
Merchandise Imports	2.2%	8.3%	10.5%	not available

*Primary mineral processing comprises primary metals and nonmetallic mineral processing industries. These are largely based on domestic ores, although aluminum smelting is based on imported ores. The steel industry also imports some iron ore, coal, scrap and other minerals used to make steel. These components are nevertheless parts of the overall mineral system in Canada and as such are affected by government mineral policy.

**Based on 1961 input-output coefficients.

***In round figures direct employment in mining and mineral processing was 93,000 and 167,000, respectively, in 1970; estimated direct plus indirect employment in the mineral industry totalled about 670,000.

Manufacturing: Canada produces most of the refined and fabricated metals and nonmetals it requires for manufacturing and other purposes. In fact more than one third of domestic mineral production is used to this end and is processed fully in Canada. In addition, Canada has important mineral processing industries that use imported minerals, including aluminum smelting and the production of phosphate fertilizers.

However, potential links between the mineral industry and other sectors may not have developed as fully as they might have. Canada imports sizable amounts of mining and other mineral industry machinery and equipment. Also, despite a large and growing processing industry, exports of minerals in crude forms have risen in recent years relative to exports in refined and fabricated forms. For example, the proportion of Canada's exports of 12 major metals* processed to the smelted or refined stage declined from about 82 per cent in 1950 to 52 per cent in 1973. Most remaining exports were in ores and concentrates. More research is required, however, before we can be certain that these and other examples provide opportunities for economic diversification in Canada.

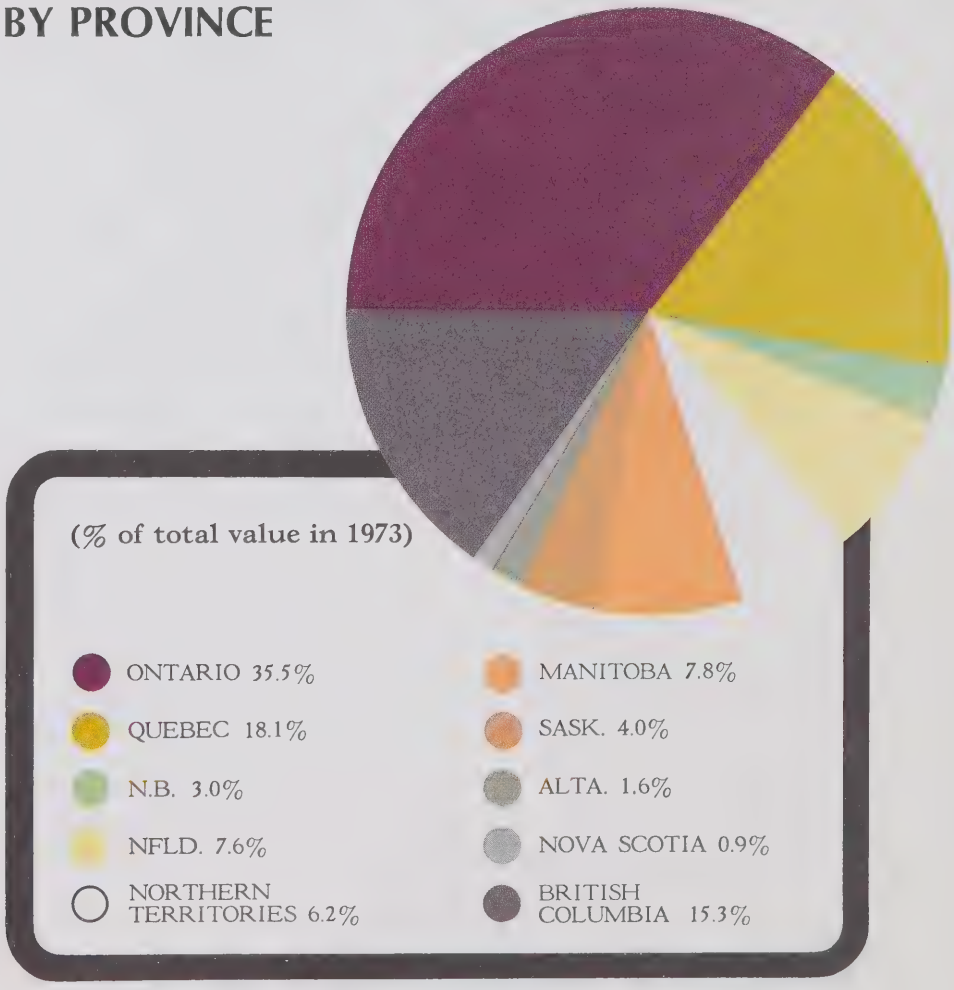
*See Figure 7. The 12 metals are nickel, copper, zinc, lead, gold, silver, molybdenum, uranium, the platinum group, cadmium, magnesium and selenium. Iron is not included but about four fifths of Canada's iron mine production is exported as ore.

e) Regional Impacts

The mineral industry has important regional dimensions in Canada. If the impact of regional mineral industry is measured in terms of gross value of output (Figure 3), a few provinces such as Ontario, Quebec and British Columbia stand out.

Figure 3

CANADIAN MINERAL PRODUCTION, BY PROVINCE



Such a comparison does not adequately show how important minerals are to the economy of each province. A better idea is gained by comparing the value added in the mineral industry, including mining and processing, with that in all goods-producing industries of each region (separate data are not available individually for all provinces). This is illustrated in Figure 4, using 1971 statistics, the latest available. "Value added" in an industry, stated simply, is the total value of its output less the value of the materials used. Thus, value added includes wages paid to employees, taxes paid to governments, and the return to invested capital ("profits") and is a better indication of economic impact than total value of output.

The figure shows that, taking the mineral industry as a whole, the impact differs substantially among regions. The Atlantic provinces in particular rely proportionately more on minerals than other regions of Canada. (Inclusion of coal mining raises the total from 21 to 24 per cent.) The distribution in each of the two components of the industry is also irregular. For example, processing is relatively much more important in Ontario and Quebec than in either the Atlantic provinces or western Canada.

Table 3:

Canadian Mineral Production by Province, 1973

(less mineral fuels)

Province	$ Million	%
Newfoundland	377	7.6
Nova Scotia	46	0.9
Prince Edward Island	1	—
New Brunswick	153	3.0
Quebec	903	18.1
Ontario	1,772	35.5
Manitoba	388	7.8
Saskatchewan	198	4.0
Alberta	78	1.6
British Columbia	765	15.3
Northern Territories	310	6.2
Canada	4,992	100.0

f) Government Revenues from the Mineral Industry

For many years, federal and provincial governments have employed policies designed to encourage growth of the mineral industry with emphasis on exploration and development, mine production and further processing to the prime metal stage. Such policies have included special tax legislation and substantial government investment in support of the mineral and other resource industries, believing that the resulting development would provide substantial net benefits for Canadians.

The most important development incentives concerning federal and provincial income taxation of mining have been the three-year exemption from income tax for eligible new mines and the automatic depletion allowance.

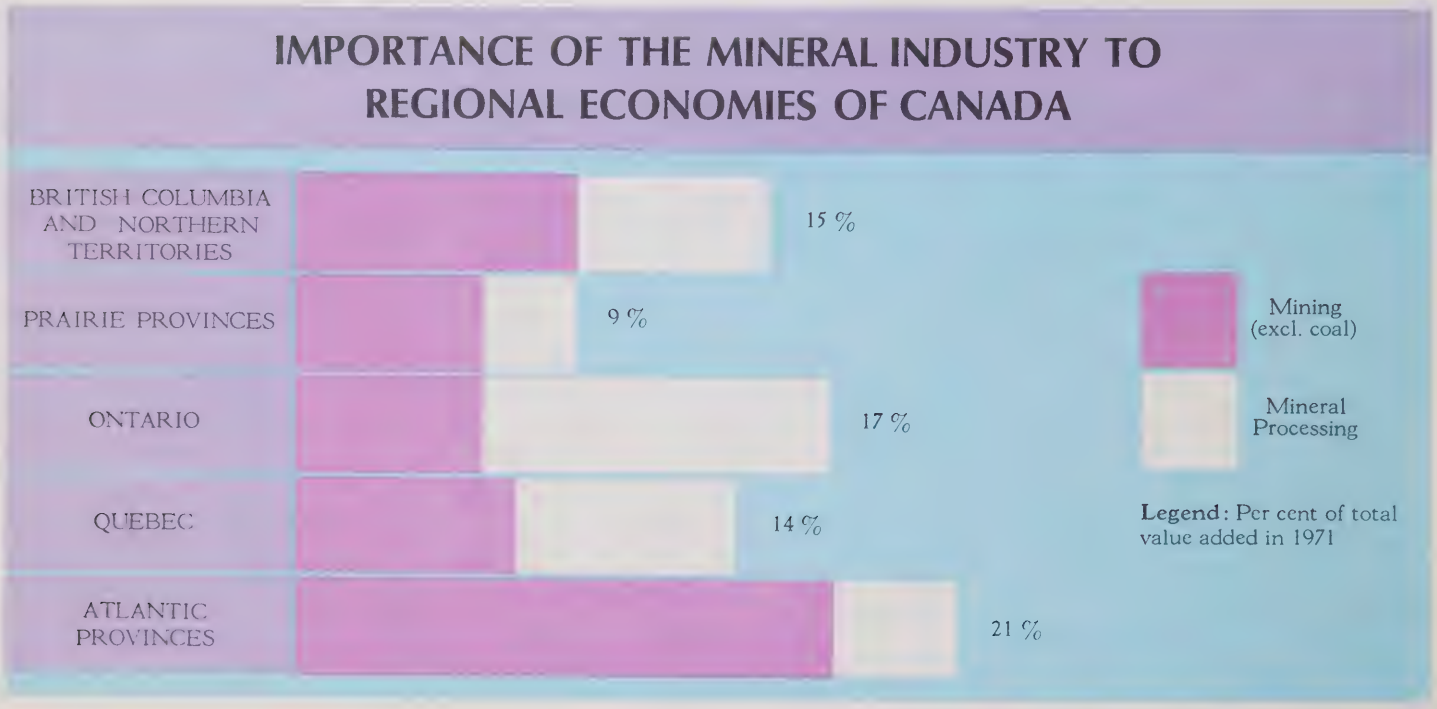
The depletion incentive allows a deduction from income, after all other deductions have been made, in recognition that as each ton of ore is removed from a mine, the mine moves closer to exhaustion. The depletion allowance is in addition to the capital cost allowance applicable to all industries which provides for recovery of the capital expenditures made in support of production.

The three-year exemption and depletion allowance not only highly encouraged exploration, development and mine production but also attempted to encourage further processing since they applied to profits at the prime metal stage (smelting and refining) if one ownership of the mineral was maintained throughout.

Thus, incentives to the mineral industry in the past have been substantial. However, mineral industry taxation has been under review at both the federal and provincial levels in recent years and important revisions have been made or proposed.

At the federal level, the basis for income taxation of the mining industry was changed at the beginning of 1972. As initially implemented, mining taxation was to be in a transitional phase from 1972 to 1976, during which time incentives were to be reduced. The three-year exemption provision was eliminated at the end of 1973. In lieu of the exemption, mining companies are permitted an accelerated capital cost allowance of all eligible expenditures necessary to achieve production—that is, no income tax is payable until a mining company fully recovers such ex-

Figure 4



penditures. The automatic percentage depletion allowance was to be replaced at the end of 1976 with an "earned" percentage depletion allowance related to mining company expenditures on exploration, development and other eligible production assets.

Federal tax changes and subsequent amendments were also designed to encourage more processing of minerals in Canada. For example, the accelerated capital cost allowance and the "earned" percentage depletion allowance both extend beyond mining to the prime metal stage, even though the processing facilities may not be owned by the mining firm.

Recent federal budget proposals indicate further modification of mineral taxation at the federal level. Similarly, some provinces have implemented or are proposing changes in their taxation of the mineral industry, particularly at the mining stage.

Direct taxation of the mineral industry is one means by which governments obtain a share of benefits accruing from the development of Canada's mineral resources. As noted elsewhere in this document, governments and the public at large also benefit through the indirect generation of employment and income and tax revenues arising from linkages between the mineral industry and other sectors of the economy. In this regard, governments' decisions on revenue sharing through taxation of mining and mineral processing can have important impacts on the rate and character of mineral development in the future, and thus can affect the degree to which potential indirect as well as direct benefits from minerals are realized.

g) Balance of Payments and the Capital Market

There are complex interrelationships between changes in the rate of output in one sector and the final balance of payments impact; their measurement is thus difficult. The CANDIDE model (an analytical tool under development) can provide additional understanding of effects on imports and exports but it cannot yet measure all the effects — for example, on external capital flows — of mineral industry activity. Simulations tend to confirm expectations, however, that expanding mine output stimulates exports more than imports and also stimulates total investment in the economy, with some of the required investment capital coming from foreign sources. Therefore, a net supply of foreign exchange has probably arisen from the mineral sector. To the extent that this is not offset in other sectors, including final consumers, minerals have contributed to upward pressure on the external value of the Canadian dollar.

Table 4:

Value Added in Goods-Producing Industries in Canada, 1971

(millions of dollars)

	Mining	Mineral Processing	All Goods-Producing Industries
British Columbia and Northern Territories	$ 270	$ 178	$ 3,044
Prairie Provinces	272	200	5,473
Ontario	709	1,598	13,856
Quebec	438	625	7,011
Atlantic Provinces	232	67	1,423
Canada, Total	$ 1,930	$ 2,668	$31,357

Note: Mining and mineral processing include metallic and nonmetallic minerals and exclude fuels.

In its rapid growth, the mineral industry has been an important user of investment funds. Because of this growth and the industry's relatively high capital intensity, the mineral industry has accounted directly for about 8 per cent of total new private and public investment in recent years. If infrastructure and other indirect effects are added, the proportion would be still higher.

Nevertheless, there is little evidence that capital needs of the mineral industry (excluding mineral fuels) have placed undue strain on domestic capital markets, although problems can arise when several major developments occur simultaneously, as in the mid-1950's. In general, adequate investment capital has been generated internally by the industry or has been available from conventional sources at competitive interest rates. There may have been other problems concerning prospective mineral developments, but the volume of capital has not been one of them.

h) Summary

Some of the above figures, particularly those used to show the size of indirect economic impacts, are only approximate and can at best give a general indication of the size of the effects. It is difficult to arrive at straightforward conclusions because the mineral sector is interwoven with other sectors and tends to have a higher ratio of indirect to direct effects on the economy than is often recognized.

It is reasonably certain, however, that mineral production has had a positive effect on economic development in Canada and that numerous industries have developed because of minerals. It is possible of course, that the benefits could have been greater if policies had been different or, alternatively, that non-mineral sectors could have provided equal stimulus to the economy in the absence of growth in mineral output. But it seems more reasonable to think that the expansion of Canada's mineral production has had a beneficial effect on Canada, and that the benefits to the economy from investment to foster the mineral industry have been worthwhile.

2 Mineral Opportunities to the Year 2000

a) Production Patterns

Forecasts of the Department of Energy, Mines and Resources indicate that, under the policy environment existing in 1972, mineral output (excluding mineral fuels) could triple in Canada between 1970 and 2000. This represents a major block of new activity for which Canadians are well qualified. However, it will be predicted more on strong external demand for Canadian minerals than on what Canadians might desire by way of rates or kinds of development.

According to these forecasts, total output in constant dollar terms could rise at 4.5 per cent a year from 1970 to 1980 and at about 3.5 per cent in the 1980's and 1990's. Exports could increase by a factor of 3.6 in the 30-year period, whereas domestic consumption of Canadian ores could at least double (Figure 5).

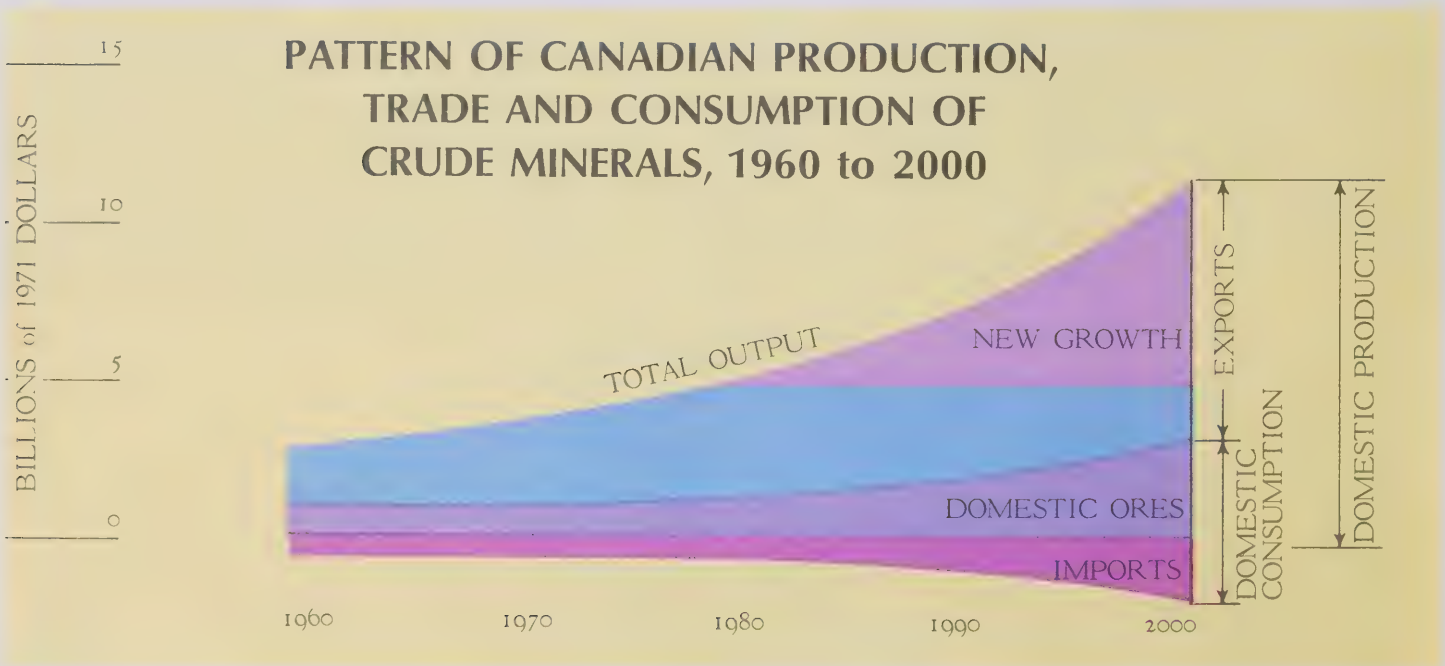
Forecasts of Canadian production of seven major commodities, which presently account for about 75 per cent of domestic ore output, are in Table 5.

Total world consumption of minerals is expected to increase by four per cent a year during the period 1970 to 2000. The world's resource base seems capable of meeting demand to 2000 and beyond. In fact, many resource-rich nations are striving to increase their mineral exports. Although the portion of Canada's production that is exported could rise from about 60 per cent in 1970 to nearly 75 per cent in 2000, Canada's share of the total world market for most of its important commodities cannot be expected to change markedly (Table 6). One must keep in mind that absolute market shares are not the sole means by which bargaining leverage arises, as competition from other world resource exporters is bound to increase.

b) Capital Requirements

Projected capital requirements for the mineral industry (excluding oil and gas) can only be estimated at this point. Based on the premise that the forecast growth in output will occur, direct capital requirements from 1970 to 2000 may amount to $25 or $30 billion (1970 dollars) for mines and quarries, and perhaps an additional $25 billion for metallic and nonmetallic mineral-processing facilities.

Figure 5



c) Implications of Forecasts

The mineral industry will continue to meet domestic requirements for most individual mineral commodities at internationally competitive prices. However, exports could take an increasing fraction of output and, if current trends continue, increasing tonnages will be exported in crude forms. Some commodities will continue to be imported, although new discoveries and technological improvements could enable domestic production of a few currently imported commodities. Past growth of the mineral industry has required large expenditures on exploration and considerable research and development. A strong, creative and innovative capability will continue to be an important aspect of public and private mineral sector activity.

The forecast growth in mineral output can make important contributions to Canadian development. But this impact may be less than desirable, even though mineral exports continue to rise, if much of these exports are in crude rather than processed forms. Alternatively, the impact could intensify if mineral activities become more diversified through increased processing and indirect impacts of the mineral sector increase through greater use of domestically produced inputs such as machinery.

Table 5:

Forecast Production for Major Commodities, 1970-2000

	Production			Average Annual Growth	
	1970	1980	2000	1970-1980	1980-2000
		(thousands of tons)			
Nickel	306	400	600	2.5%	2.0%
Copper	673	1,200	2,300	5.9	3.3
Lead	389	470	700	2.2	2.0
Zinc	1,252	1,880	3,000	3.8	2.5
Iron	52,314	88,000	150,000	5.4	2.7
Asbestos	1,662	2,200	3,980	3.0	3.0
Potash	3,498	7,300	23,430	7.5	6.0

Table 6:

Canada's Share of World Production

	1950	1970	2000
Nickel	80%	42%	30%
Copper	10	10	11
Lead	8	10	8
Zinc	9	23	20
Iron	1	6	5
Asbestos	65	43	45
Potash	0	18	22

Future capital requirements of the industry itself should not impose undue strains on Canadian financial markets, especially since the industry should be capable of generating internally a large fraction of its new capital needs. However, growth in mineral output has a substantial impact on capital requirements in the economy as a whole. Consequently, the mineral industry, if expansion continues, is one sector that could indirectly constrain development of some sectors that are less able to compete for financing but that may be desirable on other grounds, for example to generate employment and balanced regional economic development, or for national security.

Mineral industry output generates more exports than imports in Canada's merchandise trade and unless this is offset in the capital account (increased exports of capital) or current account (increased imports of merchandise and services), this will remain one source of upward pressure on the external value of the Canadian dollar.

In brief, the potential tripling of mineral output by 2000 represents a major new source of economic activity. By acting, now, governments have an opportunity to influence the extent, character, and timing of its impact on Canadian development.

Canadians are naturally concerned about the adequacy of the nation's mineral endowment in the face of growing domestic and world needs. This concern has tended to increase in recent years. Adequacy, however, tends to be a confusing issue unless it is measured in relation to specified needs, such as:

- adequacy to meet long-run domestic needs;
- adequacy to meet expected external demand;
- adequacy to sustain economic activity in existing mineral areas;
- adequacy to provide international bargaining leverage.

Adequacy is a continually changing concept and can only be meaningfully discussed in terms of cost. Continuing adequacy will depend on our ability to discover and produce minerals in the future within certain cost limits. This ability depends not only on our natural mineral endowment but also on:

- future demand patterns influenced by changes in population;
- consumption patterns and mineral-consuming technology, and the way in which demand is translated into continued exploration and development;
- future changes in mineral production technology including waste recycling and transportation;
- the rate of future mineral discoveries in competing resource-exporting countries that affect world mineral price levels; and
- Canada's general cost position compared with that of other resource-exporting nations.

3 Are our Mineral Resources Adequate for the Future

a) Mineral Endowment and Ore Reserves

What exactly is meant by "Mineral Endowment" and how does it differ from "Ore Reserves"? The latter is the portion of known mineral deposits that not only can be mined profitably under current technical-economic conditions, but also is reasonably well measured as to tonnage and grade. The former is a much wider and less precise term. It refers to all minerals in the ground that are theoretically available within certain economic limits during a specific time span in the future. This includes established reserves, many known but economically submarginal deposits, and many mineral deposits yet to be discovered. Exploration is one process through which mineral endowment is converted into ore reserves.

Both reserves and endowment have an economic as well as a physical aspect. Both rise or fall with changes in expected future costs and prices. For example, the recent rise in the price of gold has increased the size of economic gold ore reserves in Canada, because the higher price level is expected to hold and allow lower-grade ores to be profitably mined. Consequently, mineral reserves are "exhausted" only to the extent that new discoveries, reductions in production costs, or price rises do not lead to the development of new reserves fast enough to maintain a sufficient working inventory.

Table 7:

Current Mineral Reserves in Canada in Relation to Potential Growth in Mineral Output

Mineral Commodity	Canadian Output 1970 (short tons)	1970 Domestic Consumption as Percentage of 1970 Output	Reasonably Assured Domestic Reserves (short tons) (1971/72)	Years that Current Reasonably Assured Reserves would Support 1970 Level of Output Plus Annual Growth Rate of 2.5%	3.5%	4.5%	Expectations of Finding and Developing Major New Reserves at World Competitive Prices (Excellent-Average-Poor)
Aluminum	1,072,000	25.7%	—	—	—	—	Poor*
Asbestos	1,662,000	5.0	1,200,000,000	119	95	80	Average
Copper	673,000	35.4	31,800,000	32	28	26	Excellent
Iron (iron content)	32,520,000	23.8	4,200,000,000	58	50	44	Excellent
Lead	389,000	15.4 (primary)	15,000,000	27	25	23	Excellent
Molybdenum (Mo content)	17,000	—	607,000	26	24	22	Excellent
Nickel	306,000	3.9	13,500,000	30	27	25	Excellent
Potash (K_2O equivalent)	3,420,000	6.0	50,000,000,000	239	181	147	Excellent
Sulphur (elemental)	3,548,000	25.1	135,000,000	27	25	23	Excellent
Tin**	132	—	30,000	—	—	—	Poor
Zinc	1,252,000	8.5	37,500,000	23	21	19	Excellent

* All aluminum produced in Canada is smelted from imported ores; while it is not likely that ores of the type currently used will be discovered in Canada, large amounts of material exist in Canada from which aluminum might be recovered in the future through the development of new technology.

** Canada has only a minimal tin output (as byproduct) but is developing a 1,000-ton-per-year capacity by 1974 (20% of domestic consumption).

Source: Based on records of the Department of Energy, Mines and Resources, company reports, and other sources.

Table 7 gives an idea of Canada's current reserve position of several major mineral commodities in relation to recent annual output levels, as estimated by the Department of Energy, Mines and Resources. The table also illustrates the small amount of this output that is consumed domestically. It should be remembered that "reserves" are merely a working inventory that is being replenished over time, and are not an expression of ultimate supply sources.

Currently delineated reserves have been expressed in terms of 1970 output at three different growth rates. The annual growth rate of 4.5 per cent is an approximation of the rise in production of most metals over the past 25 years. The 3.5 per cent rate is the forecast average growth rate from 1980 to 2000, assuming no major policy changes. The 2.5 per cent rate implies a reduction in export growth to the approximate level of past growth in domestic consumption of many metal commodities.

These reserves constitute only that portion of resources currently "on the shelf". This portion represents the source from which supply in the immediate future will come. It is different from a "shelf inventory" in other industries in that it is not ready for shipping. It has not been mined or processed into a saleable form.

Mineral deposits are costly to find and develop. Expenditures in Canada for mineral exploration (excluding oil and gas and exclusive of mine development) have averaged about $100 million a year during the late 1960's and 1970's. In Canada we have relied mainly on the initiative of private investors, supported by public services, to develop mineral reserves. New reserves are forthcoming only if markets are available and, generally, only to the extent of meeting projected extraction rates for at best a few decades. With the help of constantly improving methods of exploration and production, total reserves have normally risen more or less in step with production.

b) Reserves Measured Against Domestic Needs

Even if all exploration and technological progress stopped immediately, Canada's current mineral reserves would be adequate to meet domestic needs far into the future for the major commodities that Canada now produces. Total anticipated domestic needs to the year 2000 as a percentage of currently established reserves in Canada are:

asbestos	0.3%	nickel	13%
copper	14%	potash	0.04%
iron	1%	zinc	16%
lead	18%		

In relation to domestic needs, our present reserves are very large because they were developed primarily in response to export rather than domestic demand. Among the examples given, this is particularly true for potash, asbestos and iron, each of which shows reserves of at least 100 times the total domestic needs to the year 2000. Reserves of other important minerals listed are at least five times our needs to 2000. Thus, if exports were discouraged, little incentive to continue exploration would exist for many years. Of course, some of the many benefits Canadians receive from mineral exports would also be foregone, and other countries would cease to regard Canada as a secure source of minerals.

Canada is not self-sufficient in all minerals, however. For example, we have no existing production of manganese, chromium, phosphorous or aluminum ores because other countries can supply our needs much more economically than could domestic sources. Here is where security of supply becomes a factor for Canada.

Although Canada is a leading world producer of aluminum metal, the aluminum ores used by the industry are imported from such countries as Guyana, Surinam, Australia, and Jamaica. The chromium used in the Canadian iron and steel industry comes mostly from mines in the USSR, South Africa, the Philippines and Cyprus. Manganese is also used in the steel industry and is imported from such countries as Brazil, Gabon, Ghana, South Africa, and Zaire. Phosphate rock for use in chemicals, fertilizers, and stock and poultry feed comes mainly from the United States. The main source of tin is Malaysia. In some cases these minerals are imported both directly from the mining countries and indirectly via third countries such as the United States, Europe and Japan where they are subjected to various processing steps.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c) Reserves Measured Against Domestic Needs and Exports

Forecasts of combined domestic and export demands to 2000 are shown here as a percentage of currently established domestic reserves:

asbestos.....7%	nickel.....96%
copper.....148%	potash
iron.....42%	less than..1%
lead.....110%	zinc.....162%

Seen in this context, current reserves for some minerals do not appear to be so large. If we assumed no further discovery or technological progress, today's copper, lead and zinc reserves probably would not last through the century (nickel seems barely adequate to 2000, but corporate information on some major mines is not available for inclusion). Are we running out ? Should the level of exports for some minerals be reduced ? What happens in the early decades of the next century ? The answers depend on our ability to continue to develop new reserves, both by discovery and by applying new technology in their production, utilization and final consumption.

d) The Outlook for New Reserves

There is no doubt that we can establish substantial additional reserves in the future, providing exploration and technological research continue, (i) by finding extensions to known occurrences and deposits, (ii) by finding new deposits that are judged likely to exist based on our knowledge of the geological environment, and (iii) by bringing currently submarginal deposits within economic reach through technological advance.

Individual mineral deposits are exhaustible and we will continue to use lower- and lower-grade mineral resources. This need not necessarily lead to higher costs; technological advances have historically held most raw mineral costs at a fairly constant level. Even if this proves impossible to maintain in the face of future demand growth, we will not be alone, as mineral suppliers in the rest of the world will face similar pressures, and therefore world prices would rise as well.

The sheer size of the country's landmass makes it highly unlikely that Canada would be handicapped in this international context by a physical lack of additional sources of many mineral commodities. As new reserves have to be considered, the main concern about "resource adequacy" in Canada is whether Canada can maintain its competitive position through exploration, whether by private or public enterprise.

Although there appear to be few serious limitations with respect to the natural mineral endowment, the supply system may be restricted by a shortage of available capital, inadequate labour quality and availability, lack of flexibility in creating additional capacity rapidly enough, fear by industry of taking risks because of uncertain or inappropriate taxation and regulation, foreign ownership considerations, exchange rate problems and balance of payment questions. Unlike physical mineral endowment, these factors are to some extent within government control.

It is difficult to predict the outlook for the Canadian mineral sector after 2000 in such a rapidly changing world. What happens will be in part a result of our mineral policies. If output were to decline, it will not be because we will run out of minerals in the ground.

Forecasts of combined domestic and export demands to 2000 are shown below as a percentage of metal in mineable deposits in the ground that we can at present confidently expect to be there. These include not only currently established reserves but also conservatively estimated additional resources that are as yet mostly undiscovered but that (if found) are likely to be within economic reach before 2000:

copper.....34%	nickel.....38%
lead.....47%	zinc.....60%

For example, total projected copper mine production for domestic and export markets to the year 2000 is expected to deplete only 34 per cent of the copper reserves either known now or expected to be found before 2000.

This combination of available data and professional judgment indicates that, for the nation generally, there are sufficient known and theoretically discoverable resources of most major commodities to meet overall domestic needs and permit projected expansion of mineral exports in this century. It is worth noting that progress in recycling technology, here or abroad, will reinforce this conclusion.

e) Need for Continued Effort

This by no means implies that we should be complacent about the adequacy of our resources. The preceding figures illustrate sufficiency for the next few decades without considering the question of long-range survival. A time lag of 10 to 20 years can exist between deciding to explore for certain commodities and being ready to mine and deliver them. If there is still to be a healthy Canadian mineral supply system by 2000, the resource adequacy outlook at that time should be at least as reassuring as it is now. This means that reserves must be not only maintained but expanded. Such an achievement will require an increasing and concerted effort in science and technology to develop more effective exploration, mining, metallurgical and bulk-transportation methods to keep Canada's costs competitive.

Unless we are prepared to let Canada's comparative advantage in the earth sciences and mineral technology wither, we cannot afford to live off our present reserves with no thought for the future. An on-going mineral supply system will require that Canada's outstanding expertise be maintained and extended to provide the mechanism to create new reserves.

Of major importance for Canada is the question of what mineral producing and processing areas will stagnate or become non-productive because of local mineral depletion before 2000. With new discoveries, technological advance and expanding markets, new regional mineral development opportunities are expected to arise. The resulting shifts in mineral development activities will require early identification of future development centres and declining mineral regions to reduce such problems as the dislocation of groups of people, and the immobility of mine equipment, buildings and various support facilities.

Canada does not have an effective early warning mechanism to assess the adequacy of mineral exploration and discovery rates, the changing picture of national and regional resource sufficiency, or the long-term reliability of foreign sources for minerals not exploitable on a competitive basis in Canada. A monitoring mechanism is needed because:

- external developments could suddenly make a much heavier demand on our resources than expected;
- production capacity, the crucial link between resources and markets, is subject to cyclical influences as well as unforeseeable financial, political, and labour constraints;
- information available to governments on actual reserves is incomplete and is greatly inferior to the quality of information on, for example, oil and gas and forest resources. Certainly, data available to the governments on mineral resources are inadequate to meet the full range of mineral policy questions.

4 International Factors Bearing on Mineral Policy

Apart from balance of payment problems and international monetary problems that frequently strain international trade, there are a number of other international considerations that will affect Canada's ability to capture additional benefits from minerals. While introducing constraints, many of these considerations may also be viewed as providing opportunities as well.

a) The World's Mineral Supply Base

Policy makers in mineral-producing countries must deal with the natural geological dispersion of economic mineral deposits. Even though Canada has a large and diversified mineral endowment and world demand for minerals is forecast to grow at a lively pace, Canada does not enjoy a monopoly position as a world mineral supplier. In the past two decades the world's mineral supply base has broadened considerably and more nations are producing a variety of minerals that compete with Canadian minerals in international markets. Through expansion of supply, the seller's market that existed in 1973-74 for some mineral commodities may be of short duration. Indeed, Canada's dominant position in some minerals (e.g., nickel and asbestos) has become eroded.

In the face of an ever-broadening world mineral supply base, we cannot assume that the combination of increasing world demands and a bountiful mineral endowment in Canada should in themselves necessarily lead to substantially increased benefits from expanding mineral export opportunities.

b) Ocean Mining

The world's oceans may be on the verge of becoming a new mining frontier for some metals such as manganese, nickel, copper and cobalt, and for other minerals such as phosphates, sand and gravel. Metal-bearing nodules are known to be plentiful in certain areas of the ocean floor, but deep ocean mining is not yet economically feasible. Within a decade the current domestic supply pattern of nickel could be influenced to some extent by ocean mining, and more strongly later on. This influence could be felt in establishing a price ceiling for nickel and could also alter current trading patterns in world nickel markets.

Ocean mining may also provide opportunities for Canada. In this regard, how much attention should be devoted in Canada to developing the technology to compete with other nations in the earliest possible exploitation of ocean resources? This question was considered in the new Oceans Policy announced in 1973. The policy statement indicated that Canada must develop and control, within her own borders, the essential industrial and technological ingredients to exploit offshore resources. The policy statement also said special emphasis should be given to a wide range of marine science and technology programs relating to management of the marine environment, to renewable and non-renewable resources, to development and maintenance of ocean engineering at universities, and in government laboratories, and to development of better forecasting of weather, currents, ice and similar atmospheric and oceanic factors. Within five years, Canada should achieve world-recognized excellence in operating on and below ice-covered waters. The policy statement also emphasized that Canada should stand equal or superior to foreign governments or large multinational corporations in developing and maintaining an up-to-date information base on its renewable and non-renewable offshore resources.

Questions of legal ownership and management of such resources in offshore areas could continue to occupy governments and the United Nations for many years. It is hoped that an effective and generally accepted legal formula will evolve soon, perhaps assisted through agreements reached at the Law of the Sea Conference, to allow effective management of these resources. However, it is still too early to predict when this will come about.

c) Mineral Acquisition by Consuming Nations

The United States has been our most important mineral market and remains so (see Table 8 and Figure 6) but markets for many minerals have become more diversified over the past two decades. This diversity strengthens Canada's international leverage and the prospect is good for additional new export markets.

Industrial nations have become increasingly concerned with security of mineral supplies to sustain their economies in the years ahead, a concern that works in Canada's favour. In Japan, for example, this issue has become a major preoccupation.

The consuming nations maintain long-held objectives on how, and in what form, they obtain their mineral requirements. There is a high degree of coincidence in mineral acquisition strategies:

- to acquire resources in the least processed form so that benefits from further processing accrue to their own economies, and
- to diversify their supply base to avoid overdependence on any particular source nation.

They have implemented these procurement objectives with specific strategies, as for example:

- progressively higher tariffs and other trade barriers on processed mineral products while allowing the free entry of crude minerals;
- the encouragement of transportation technologies to reduce costs in a worldwide movement of crude minerals in bulk carriers;

- the encouragement of home-based international corporations to diversify their mineral exploration and development activities throughout the world; and
- the provision of exploration and development capital in return for long-term supply contracts for crude ores and concentrates.

Recent statements suggest, however, that some leading industrial countries such as Japan and members of the EEC might be willing to import more highly processed minerals. In Japan, for example, problems of environmental pollution, land and labour shortages, and balance of payments pressures have prompted proposals to limit growth of primary industries based on crude resource imports. There also seems to be some recognition, in a number of larger industrialized countries, that they can increase the security of their mineral supply by agreeing to facilitate the processing of more resources in the countries where the ores are mined.

d) Trading Blocs

During the past two decades, large trading blocs have been established, some with common external tariffs and plans for eventual economic integration. In the European Economic Community, the question of common material procurement objectives has been debated, but member nations continue to pursue policies that have served their needs in the past. Some of these countries have strong historical links with former colonies and wish to see these accommodated in any common policy. For Canada, the matter of trading blocs and preferential treatment has been brought into sharp focus with Britain's recent entry into the EEC.

e) Producer Nations Arrangements

A number of developing nations that are large exporters of key minerals have become partners in commodity arrangements. Examples are The Intergovernmental Council of Copper Exporting Countries (CIPEC) and The Organization of Petroleum Exporting Countries (OPEC). Others have been proposed (e.g., iron ore and bauxite), but Canada has never participated as a member. The objective of these producer organizations is to stabilize markets and to capture, for their member nations, a larger share of the benefits resulting from the exploitation of their minerals. Another objective of most developing nations is to achieve increased domestic processing of their mineral exports, some of which (e.g., bauxite for aluminum production) are imported by Canada.

Table 8:

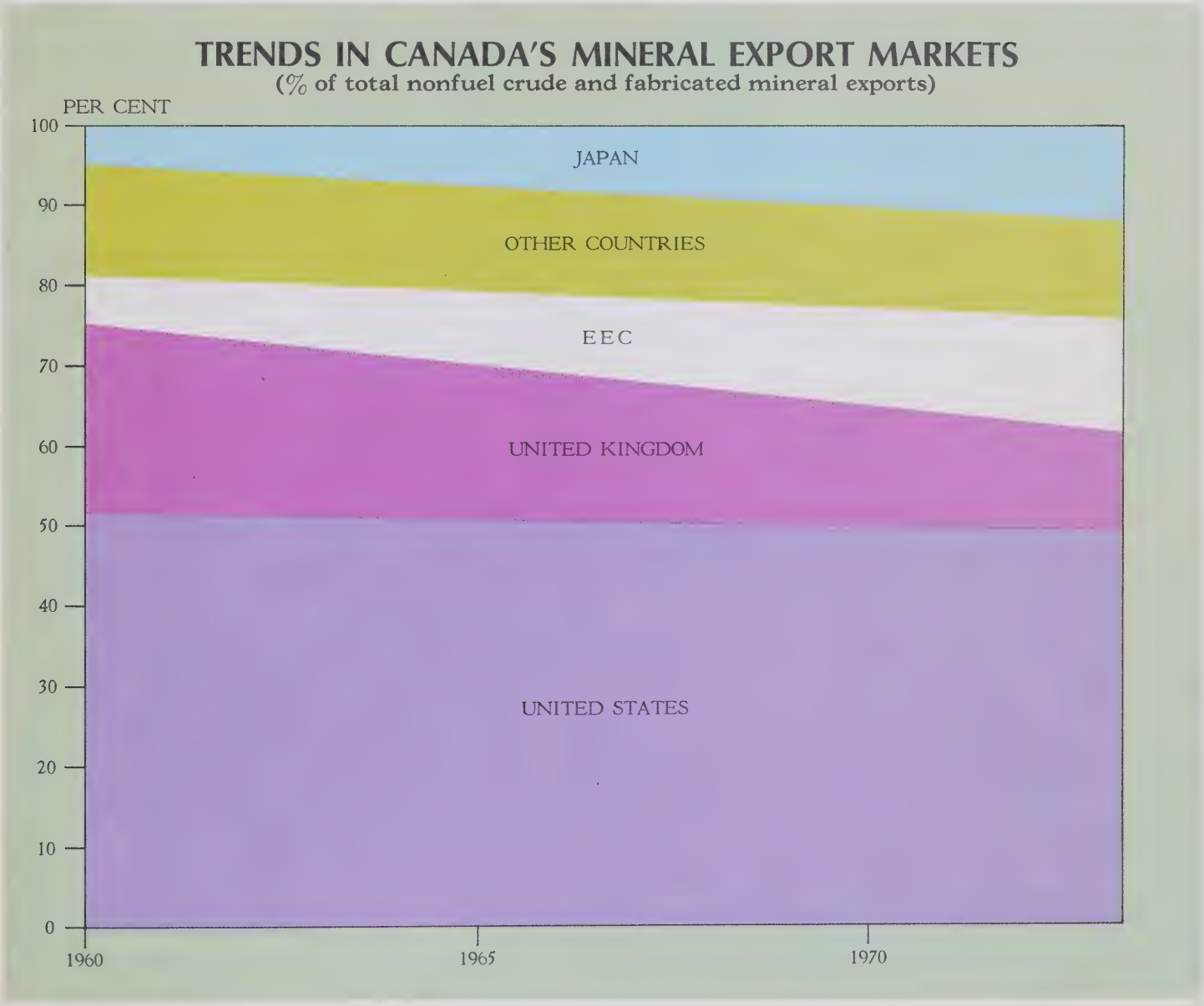
The Importance of Canadian Minerals in United States Supply Pattern, 1970-73 Average[1]

Commodity	Canadian Exports to the U.S.A. as % of Canadian Production	Imports from Canada as % of Total U.S. Imports	Imports from Canada as % of Total U.S. Consumption	Major Alternative Source of Supply to U.S.
Asbestos	41	97	87	Belgium[2]
Nickel	46	63	57	Norway[3]
Potash	71	95	57	Israel
Gypsum	74	77	29	Mexico
Zinc	34	55	24	Australia
Iron ore	46	51	16	Venezuela
Silver	71	52	52	Peru
Sulphur	23	72	9	Mexico
Lead	24	31	16	Peru
Copper	21	37	7	Chile

1. From Statistics Canada, and U.S. Bureau of Mines Minerals Yearbook.
2. Transshipments of exports from other countries.
3. Based on Canadian ores.

These attitudes of developing countries have also been reflected in the United Nations Committee on Natural Resources during discussion of such items as permanent sovereignty over natural resources. In this latter area, Canada has felt increasing sympathy for the views of developing countries and increasing recognition of common interests with other economically advanced resource exporting nations such as Australia.

Figure 6



Note: Shares calculated by linear regression on annual data.

Through producer groups such as those mentioned above, developing countries hope to gain increased benefits from the sale of their resources. Canadian policy toward commodity trade has been generally to the effect that, if some form of intergovernmental arrangement is needed to supplement normal marketing procedures, it should preferably include both producers and consumers, not just one or the other. Such a policy, it can be argued, has served Canada well and has helped develop our image as a reliable supplier. It is also a policy that has emphasized Canada's historical alignment with developed consumer countries, including the United States and the United Kingdom, our two largest mineral customers.

As Canada searches for ways to derive the maximum benefit from its resource base, it is no longer clear that our interests are in all cases parallel with those of other developed countries. Canada might succeed in obtaining increased returns from the sale of its resources and perhaps improved market access for processed resource products by bargaining together with other resource producers. A contribution by Canada to producer associations and world market stability could be the provision of technical expertise from both industry and government levels. This report is not advocating that Canada should participate in international producer arrangements but such alternatives may merit further exploration. Canada is not alone among economically developed resource exporting countries in seeking increased benefits from its resource base. For example, Australia is also reevaluating and modifying conditions under which it promotes mineral development. Thus, new Canadian policy initiatives need not place Canada in isolation among established secure suppliers.

f) The General Agreement on Tariffs and Trade (GATT)

A major factor that has molded the development of the Canadian mineral industry is the terms and conditions of trade. For example, the U.S. tariff rates on minerals and refined metal, and Japanese purchasing policies, have been among the major considerations in many important corporate decisions affecting Canada. In the GATT, many of these subjects have been institutionalized by international agreement or modified in international bargaining. One opportunity for such bargaining is the new round of multilateral trade negotiations which began in the fall of 1973. Successful negotiations would improve access for Canadian minerals, particularly processed minerals, to major world markets.

The possibility of negotiating on a sectoral basis was put forward by Canada during the preparatory discussion for the round of talks. The proposal, if accepted, could mean the reduction or elimination of tariffs and other artificial barriers to trade, on a mineral ore and all of its derivatives to the fabricated stage. As well, improved market access for fully manufactured goods that were not encompassed by sector negotiations could provide opportunities to add to the value of our minerals prior to export.

g) International Corporations

The world of minerals is progressively and rapidly becoming the domain of international corporations with the large capital and technological resources increasingly necessary to explore for and develop mineral deposits. These corporations, partly within constraints imposed by their home countries, search for development opportunities on a worldwide basis.

The major mineral markets are international in character and mineral development capital is internationally mobile. So, in policy formulation, we must recognize that international (including Canadian-based) corporations now operating in Canada can shift their technical and financial capabilities to other countries if they perceive more favourable opportunities elsewhere.

However, governments also have the ability to mobilize the large amounts of capital required for mineral exploration and development. Indeed, there has been increasing public participation in mineral-based activities in Canada, at both federal and provincial levels, and in other countries.

h) International Monetary Arrangements and Monetary Stability

The interaction of the above and other international factors in recent years has tended to alter both international commodity trade flows and the direction and magnitude of international capital movements. These trends, combined with recent strong international demand and rising prices of resource commodities, have contributed to serious balance of payment disequilibrium and exchange rate problems for many nations, both industrialized and less developed. As a result, they have had a profound impact on international monetary stability and on the international monetary institutions and adjustment mechanisms developed since 1946.

While Canada is in a position to benefit from higher mineral prices, and perhaps expanding opportunities for mineral processing that are attributable to the above trends, it is also a leading trading nation and one of the world's most open economies. An unstable, and particularly a rising foreign exchange value of the Canadian dollar can have major impacts on the international competitiveness of mineral-based and other manufacturing in Canada. Consequently, Canada has participated actively in international efforts to develop new and more stable monetary arrangements and adjustment mechanisms.

5 Internal Factors Bearing on Mineral Policy

Aside from the external factors reviewed above, there are several factors within Canada that will increasingly influence the mineral system and the way in which it can best make an impact on domestic development.

a) Social Considerations

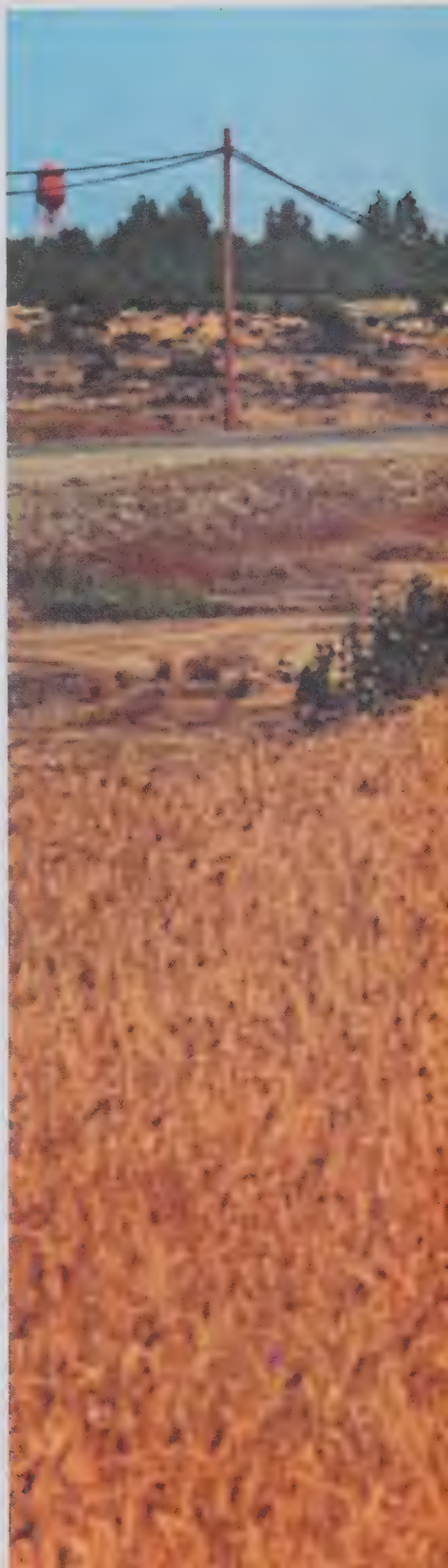
To achieve a balance of social and economic growth in various regions of Canada, increased emphasis must be placed on developing and maintaining a productive labour force. Incentives, agreements and regulations can reduce regional disparities while effective training programs and the development of adequate social amenities can bring about an increase in employment and social well being.

While providing employment opportunities enabling indigenous populations to achieve higher living standards, the mineral industry may be expected to demonstrate an increasing social awareness by recognizing distinctive cultural and social identities. Despite the trend towards urbanization, sectors of the Canadian population may be expected to remain in frontier and other non-urban environments through preference for the special qualities of life available there. These distinctive qualities of life should be maintained and enhanced.

b) Stability of Communities, Employment and Income

Mineral supply and demand, for various reasons, tend to be quite cyclical, with periods of shortages and high prices typically followed by periods of excess supply and depressed prices. These cycles can have major impacts on the economies of communities in Canada based on mineral activities.

The emergence of international trading blocs with strong links to selected resource exporters, combined with competition from an increasing number of mineral suppliers, adds to Canada's vulnerability to world supply-demand imbalances. This can have undesirable effects on the economy generally, in addition to causing uncertainty in income and employment for families and communities dependent on mining. Decisions on the rate and pattern of resource development in Canada and how we negotiate internationally will determine the extent to which such problems can be minimized.

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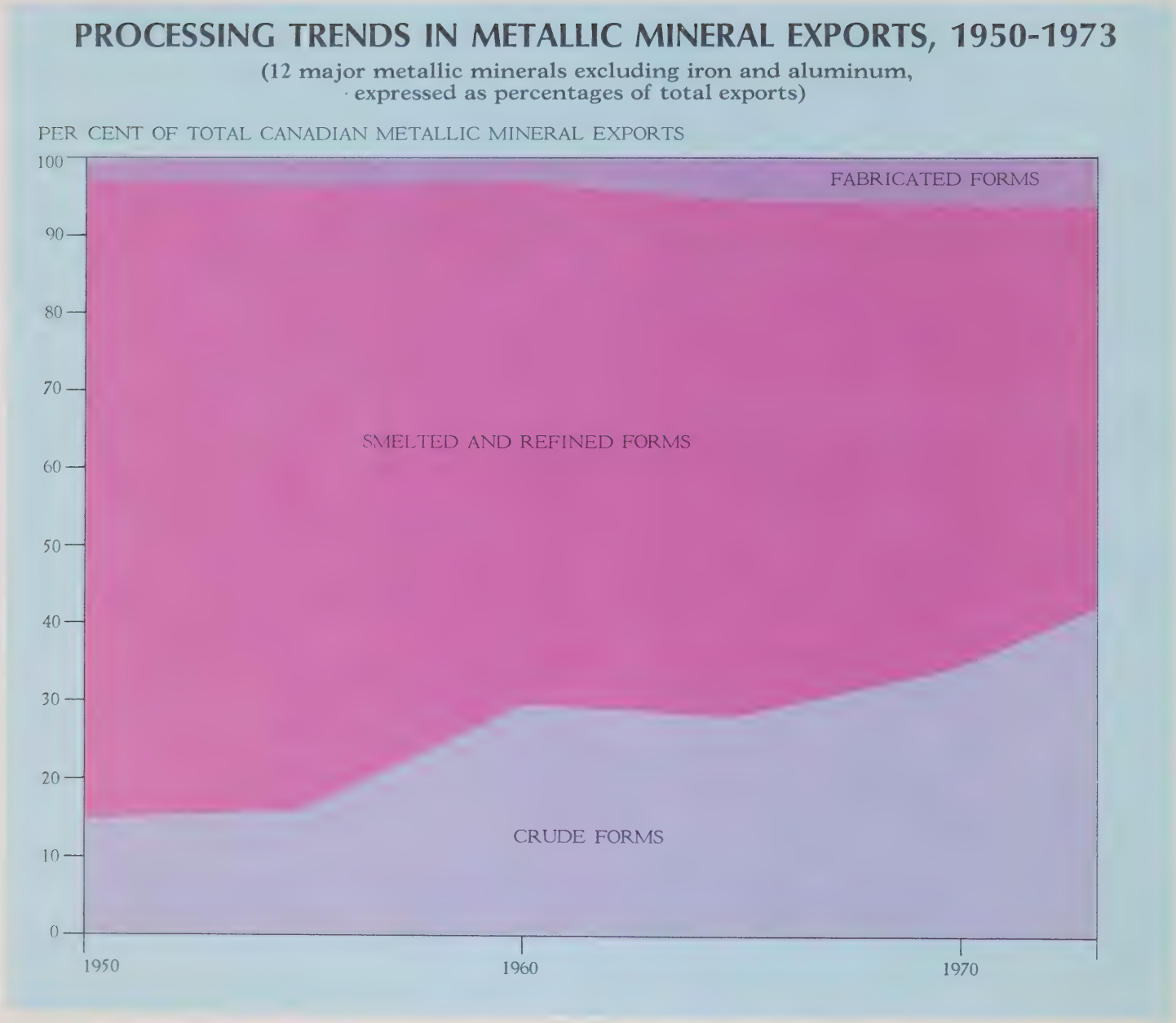

PROCESSING TRENDS IN METALLIC MINERAL EXPORTS, 1950-1973
(12 major metallic minerals excluding iron and aluminum, expressed as percentages of total exports)
PER CENT OF TOTAL CANADIAN METALLIC MINERAL EXPORTS
100
90
80
70
60
50
40
30
20
10
0
FABRICATED FORMS
SMELTED AND REFINED FORMS
CRUDE FORMS
1950
1960
1970

Figure 7

c) Land-Use Competition and Environmental Quality

The exploration phase of the mineral industry initially requires access to relatively large areas of land. Increasingly, conflicts will arise among natural resource developers in such fields as minerals and hydro-electricity, and between these and conservationists who seek to protect virgin areas of Canada and to preserve the natural landscapes near urban areas (e.g., the Niagara Escarpment), many of which are judged to contain important mineral potential. These basic conflicts may become more difficult to resolve in the future.

Assuming that mineral development is an acceptable use of land in most regions, Canadians will expect this development to proceed with minimum disturbance to the environment. Resource managers cannot sidestep this issue because the potential social, economic and aesthetic consequences are too great. While mining sites, during their operational phase, are not large, off-property effects on water quality and the landscape can be widespread. Reclamation of mined land on completion of mining is becoming more common and does not appear to be excessively costly in most areas.

Air pollution from metallurgical plants poses a more difficult problem. This is a special challenge if further processing is chosen as an objective. Technology offers the promise of nearly pollution-free processes at all stages but until they are commercially proven, governments will be faced with choosing between industrial activity and environmental protection.

d) Crude Exports or Further Processing

Although smelting, refining and fabricating in the mineral sector continue to increase (Table 1), the importance of these processing activities relative to Canadian mine production is declining. This trend is illustrated indirectly in Figure 7 for the 12 metallic minerals listed previously. The figure shows that exports in crude or concentrated forms have risen from 15 per cent of total exports in 1950 to 42 per cent in 1973. Conversely, the share of smelted and refined metal has fallen even though that of fabricated metal has risen slightly. Taking into consideration the exports of iron ore (which total about four fifths of domestic iron ore production) and nonmetallic minerals such as asbestos, potash and gypsum, it can be said that minerals in crude forms predominate in exports.

Figure 7, taken alone, gives an incomplete picture of Canada's interests with regard to mineral processing, however. For example, nonmetallic minerals — unlike metals — are often consumed or used in manufacturing with little or no processing beyond mining and milling. Unless such manufacturing is viable in Canada, the alternatives may be limited to exporting crude forms or none at all. Nevertheless, Canada's nonmetallic mineral-process-

Table 9:

Non-Resident Control of the Canadian Mineral Industry

(assets of firms owned 50% or more by non-residents)

	1965	1968	1969	1971
Metal Mining	38.5%	44.2%	55.5%	51.8%
Nonmetal Mining	48.8	56.3	56.0	57.2
Primary Metals	59.1	55.3	43.6	41.9
Nonmetallic Mineral Processing	36.9	51.6	52.1	59.2
Total Nonfuel Mineral Industries	48.5	51.5	51.6	51.0

Note: Figures for 1969 and 1971 are not exactly comparable with those for 1965 and 1968 due to a change in statistical classification (see also text).

ing industry has grown quite rapidly in recent decades, primarily for domestic markets. Alternatively, important mineral processing activities in Canada are based on imported raw materials. Examples include aluminum smelting, some ferro-alloy production, and several types of nonmetallic mineral processing.

Without appropriate new policies, the percentage increase in the export of crude ores and concentrates could continue to rise. Significant processing and manufacturing of Canadian resources will continue to be done elsewhere with the consequent reaping of benefits by other industrial countries. Canada's ability in the future to convert output into more highly processed or final consumer products before export, or to replace imports with domestic production, will depend on trends in processing costs in Canada relative to other countries, but also success in evolving additional strategies for domestic industrial development and access to external markets. Recent changes in energy costs plus other considerations seem to have improved prospects for competitive processing in Canada.

In May 1974, the federal government enacted Bill C-4, An Act to Amend the Export and Import Permits Act. Among other changes, the amendment would permit the federal government to restrict the exportation of any mineral product produced in Canada where national policy might require the further processing of that product in Canada. This change, which is approximately parallel to recent legislation in, for example, Australia, provides a lever that could be used to supplement other federal and provincial measures designed to achieve additional mineral processing in Canada. The federal government has emphasized, however,that no specific situations are in mind for application of the new legislation.

e) Increased Foreign Control of the Mineral Industry

Recent trends in the extent of foreign control in the Canadian mineral industry, excluding coal, oil and gas, are shown in Table 9.

These figures are based on the assumption that control requires at least 50 per cent ownership and may therefore understate actual foreign control. Because of a change in statistical classification between 1968 and 1969 when several large, integrated mining-smelting firms were transferred from "primary metals" to "metal mining", figures for 1965 and 1968 are not directly comparable with those for 1969 and 1971. Nevertheless, different trends are indicated for different components of the industry. Foreign control rose in all but primary metals during the 1960's but then declined for metal mining and processing and the industry as a whole after 1969. The increase continued into the 1970's for nonmetallic mineral mining and processing, however.

Extraction of commodities from ores of lower grade, and the increasing scale of mining operations, mean that future mineral developments will continue to become more capital intensive. In the absence of major public measures such as direct participation or increased incentives to smaller domestic mining firms, large international corporations, including Canadian-based firms, are likely to increasingly dominate the financing of new mineral production facilities.

f) Increased Business Uncertainty

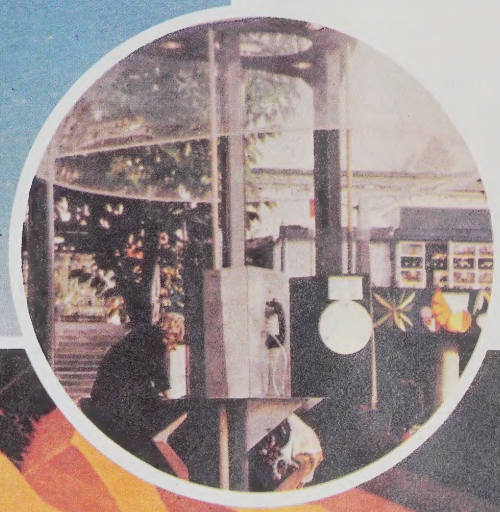
Despite increasing public participation in the mineral industry in Canada, the private corporation will maintain a major role in mineral industry exploration and development. Governments are collectively responsible for the total business environment within which corporations make investment and operating decisions. Although return on invested capital is the major factor in their decision-making, corporations do not like uncertainty and seek to control or predict as many variables as possible.

Major new policy initiatives affecting minerals in Canada may be seen by business as increasing their uncertainty or as reducing their attainable rate of return. As mining capital provided by the private sector (including that of domestically owned firms) is internationally mobile, it is highly sensitive to changes in investment climates in different countries. The private sector is one major vehicle, along with the public sector, by which mineral policy objectives are realized. The effectiveness with which the mineral industry contributes to Canadian objectives is critically dependent on capturing the understanding and cooperation of the mineral industry.

g) An Opportunity for Improved National Unity

The federal and provincial governments share responsibility for overall management of the nation's mineral resources. All governments are giving increased attention to defining more precisely the benefits to be sought from minerals and this is reflected in a number of recent legislative and regulatory changes affecting the mineral industry. There are, however, differences between these authorities arising out of variations in immediate as well as longer range priorities, and in the role each sees for the mineral industry.

When there are major differences in priorities and policies among provinces and between individual provinces and the federal government, the door is opened for foreign governments or international firms to play off political jurisdictions one against the other. The formation of the Canadian Ministerial Conference on Mineral Policy, along with increased bilateral consultations, are recent steps to improve the management of minerals for the best benefit of Canadians.



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